Steps Towards Multi-Material Domain

1) Low , Poisson (Gauss-Seidel)

2) Low , Pseudo time step (uniform , assume )

3) Low , Pseudo time step (uniform , do NOT assume )

4) Low , Pseudo time step (non-uniform , do NOT assume )

# First two steps

Conclusion: div(B) behaves differently for these two methods

# Second two steps

We must write an operator to compute

and

Or, in general

Notation

: 1st derivative, 2nd order central difference along

: 2nd derivative, 2nd order central difference along

1st order one-sided difference along \*\*

# Operator 1

If , this provides a 2nd order accurate stencil for the mixed derivatives. But if is uniform and , this is inconsistent with the 2nd derivative, 2nd order accurate operator:

This resulted in oscillations in the magnetic field

# Operator 2

But this results in a significantly different magnetic field distribution compared with the Poisson result. Also, I don't like the fact that the operator is directional. I suspect that this will certainly result in divergence errors.